

WHAT IS CLAIMED IS:

1. A ground detection apparatus for electric vehicle having a DC power supply circuit which is electrically insulated from a body of vehicle, comprising:

a coupling capacitor which is connected to the DC power supply circuit;

a detection signal generator outputting a ground detection signal comprising a periodical waveform, the detection signal generator being connected to one terminal of the coupling capacitor through a detection resistor;

a signal detector detecting a voltage amplitude of one terminal of the coupling capacitor;

a converter converting the detected voltage amplitude into an insulation resistance on the basis of the relationship between a preset voltage amplitude and a preset insulation resistance; and

a level detector detecting levels of insulation resistance deterioration of the DC power supply circuit by comparing the converted insulation resistance with a preset ground decision threshold value.

2. An apparatus according to claim 1, wherein the signal detector performs sampling of the voltage amplitude at a predetermined period.

3. An apparatus according to claim 1, wherein:

the signal detector performs sampling of the voltage at a sampling period which is a half the period of the periodical waveform to detect the voltage; and

a calculator calculates a difference between a first voltage detected by the odd-numbered sampling at the sampling period and a second voltage detected by the even-numbered sampling to acquire the voltage amplitude.

4. An apparatus according to claim 3, wherein the first voltage and the second voltage are converted into insulation resistances, respectively, and the difference between the converted resistances is compared with a preset abnormality decision threshold value to detect abnormality of the periodical waveform.

5. An apparatus according to claim 1, wherein the periodical waveform is a square waveform.

6. A ground detection method for electric vehicle having a DC power supply circuit which is electrically insulated from a body of vehicle, a terminal of a coupling capacitor being connected to the DC power supply circuit, comprising steps of:

outputting a ground detection signal comprising a periodical waveform through a resistor to the other terminal of the coupling capacitor;

detecting a voltage of the other terminal of the coupling capacitor;

converting the detected voltage amplitude into an insulation resistance on the basis of the relationship between a preset voltage amplitude and a preset insulation resistance; and

detecting levels of insulation resistance deterioration of the DC power supply circuit by comparing the converted insulation resistance with a preset ground decision threshold value.

7. A method according to claim 6, wherein:

the signal detecting operation performs sampling of the voltage at a sampling period which is a half the period of the periodical waveform to detect the voltage; and

the converting operation calculates a difference between a first voltage detected by the odd-numbered sampling at the sampling period and a second voltage detected by the even-numbered sampling to acquire the voltage amplitude.

8. A ground detection apparatus for electric vehicle having a DC power supply circuit which is electrically insulated from a body of vehicle, comprising:

coupling means which is connected to the DC power supply circuit;

output means for a ground detection signal comprising a periodical waveform, the output means being connected to one terminal of the coupling capacitor through a detection resistor;

signal detection means to detect a voltage amplitude of one terminal of the coupling capacitor;

conversion means to convert the detected voltage amplitude into an insulation resistance on the basis of the relationship between a preset voltage amplitude and a preset insulation resistance; and

level detection means to detect levels of insulation resistance deterioration of the DC power supply circuit by comparing the converted insulation resistance with a preset ground decision threshold value.